Highly Pathogenic Avian Influenza A AKA HPAI ~AKA H5N1

Lindsey B Gottlieb, MD Assistant Professor of Medicine Division of Infectious Diseases Hospital Epidemiologist, EUH/EUOSH



CDC & NIAID

Conflicts of Interest

• No conflicts to disclose



H5N1: Historical Perspective

Subtype of Influenza A virus

Virus itself is not new

• First recognized in China in mid-90's in domestic waterfowl

Initially associated with poultry outbreaks w/high mortality

Like other Influenza A viruses, has evolved over time

• Facilitated spread to other continents

H5N1 BI	RD FLU	
HONS	1996-1997 H5N1 bird flu virus firs	t detected
	In 2006, highly publicities when influence HSNL virus is dentified in domestic waterflow in Southern China. The v neurod Algoose (Gaangdong) 1/ 1996. In 1997, HONL po outpreaks happen in China and Hong Kong with 18 asso human cases (5 deaths) in Hong Kong. This virus world go more than 360 human infections with a greater than 501	first Inits IS Ultry Sated I death rate.
and the second s	H5N1 spreads 2003-2005	-
For several years, (KM) in 2003, HSM3, re-eme cause widespread pour spread HSM3 to pourt termag/jatain (HA) (pr groups (cludes), Multip	Lyoruses were not widely detected, however, right in Danu and several offer countries to itry outereaks acress Asia. In 2005, wild bints y in Africa, the Mosle East and Europe. The ne of the virus diversifies into many genetic in genetic inwages (genotypes) are detected.	What ha
set as	2014-2016 H5N6 and H5N8 viruse	es emerge
	Gene-swapping of HS viruses from poutry and wild brits emergence/detection of HSM8 and HSM8 virus subtyper further into clade 2.3.4 An Asia, Africa, Europe, the Md North America. HS viruses with various resummividuse (continue to be detected, including in 115, wild brits and	Leads to LHA diversifies de East and Wij genes poulty
2.3.4.4b viru	ses spread widely 2018-2020	
HSN6 and HSN8 v Bie original HSN1 70 Hported HSN6 The HS HA diversit predominant, in Asi	rises become predominant globally, replacing inuses. As of 2002, there have been more than human inflections and 7 H5NB human infections. es further into clade 2.3.4.4b which becomes a, Africa, Europe, and the Middle East.	
HIRL mark 23.4 m	2021-2022 H5N1 found in Canada	. US
	A new H5N1 virus belonging to clude 2.3.4.4b with a r undepted N1 NA gene energies. Clude 2.3.4.4b H5N1 vir predominent in Asia. Mina, Europe, and the Midtle East 2001. The virus is detected in Canada and U.S. wild brid in Patrawy 2002, the virus begins subarily distribution and backyout povity. At Viris time, two human backs with brid fla viruses fause been reported. One occurred in the U in 2001 and one in the United States in 2002. More information is available: <u>Mate Viruses (ase don'The winerthal Internal Ace</u>)	elit bird ses become by the end of s in lete 2021 s commercial s connect HDN1 whet Kington

Emergence and Evolution of

Human Infections

- Sporadic cases in humans since 1997
- Receptors predominantly located in LRT, also conjunctiva
- Majority w/direct (unprotected) or close exposure to infected animals (mostly poultry)
 - Few cases of limited human-to-human transmission after prolonged exposure (last reported 2007)
- Clinical presentation very similar to other Influenza A strains, but more severe

H5N1: Contemporary Events

- Clade 2.3.4.4b emerges in 2020 in wild birds --> global spread --> detected in US and Canda by end of 2021
 - Now detected in commercial, domestic and/or wild birds in all 50 states
- 2024: detection in livestock including dairy cattle



H5N1 in Dairy Cattle

- Not fatal
- Symptoms range from asymptomatic to anorexia, decreased milk production
- High levels of virus in raw milk
- Other animals associated with these outbreaks



Human Infections in US

- 68 confirmed cases since start of outbreak
- Transmission:
 - Majority with dairy cattle or poultry farm exposure
 - No human-to-human transmission



Human Infections in US

- Clinical presentation:
 - Majority mild
 - Conjunctivitis common
 - 1 fatality

Table 2. Clinical Characteristics of and Outcomes in 45 Case Patients with Highly Pathogenic Avian Influenza A(H5N1)	
Virus Infection Who Had Exposure to Infected Animals.*	

Variable	Exposure to Poultry (N = 20)	Exposure to Dairy Cows (N = 25)	Overall (N=45)
Signs and symptoms			
Conjunctivitis — no. (%)	19 (95)	23 (92)	42 (93)
Measured fever or feeling feverish — no. (%)	12 (60)	10 (40)	22 (49)
Respiratory symptoms — no. (%) †	9 (45)	7 (28)	16 (36)
Cough	3 (15)	5 (20)	8 (18)
Sore throat	7 (35)	6 (24)	13 (29)
Shortness of breath	3 (15)	4 (16)	7 (16)
Myalgia — no. (%)	11 (55)	8 (32)	19 (42)
Headache no. (%)	11 (55)	9 (36)	20 (44)
Fatigue no. (%)	6 (30)	4 (16)	10 (22)
Nausea — no. (%)	6 (30)	0	6 (13)
Vomiting no. (%)	1 (5)	1 (4)	2 (4)
Dianhea — no. (%)	2 (10)	0	2 (4)
Clinical constellations			
Status with respect to conjunctivitis no. (%)			
Conjunctivitis only	4 (20)	11 (44)	15 (33)
Conjunctivitis plus any respiratory symptom	8 (40)	6 (24)	14 (31)
Conjunctivitis plus any nonrespiratory symptom	7 (35)	6 (24)	13 (29)
Only nonconjunctival symptoms	1 (5)	2 (8)	3 (7)
Symptoms still present at time of interview	2 (10)	7 (28)	9 (20)
Median no. of days with symptoms (range)‡	2.0 (1.0-8.0)	5.0 (2.0-7.0)	4.0 (1.0-8.0)
Oseltamivir treatment — no. (%)	18 (90)	21 (84)	39 (87)
Median no. of days between symptom onset and treatment (range)§	1.0 (0-8.0)	2.5 (0-8.0)	2.0 (0-8.0)
Median no. of days of oseltamivir treatment (range)¶	5.0 (3.0-10.0)	5.00 (5.0-10.0)	5.0 (3.0-10.0)
Hospitalization — no.	0	0	0
Death no.	0	0	0

2 Contaminated Surfaces 1 Direct Contact (Most Common) Healthy looking birds can still Touching virus and then spread bird flu touching the Bird flu - eyes, virus - mouth Bird flu virus 10 Infection can occur without touching poultry. Bird Flu Virus in the Air (in Droplets or Dust) Virus enters through the Bird flu virus eyes, Nasal nose -1.00 passage or mouth 3 Lungs Flapping wings Shaking head Scratching U.S. Department of Health and Human Services CDC incelors for Disease www.cdc.gov/flu/avianflu/avian-in-humans.htm etted and Presention

How Infected Backyard Poultry Could Spread Bird Flu to People

Human Infections with Bird Flu Viruses Rare But Possible

H5N1 Bird Flu Might Spread from Cows to People in Several Ways



- 9

CLOH 157

Case Detection

- Most commercially available Influenza tests don't distinguish H5N1
- PH Authorities performing the following:

Targeted surveillance of exposed individuals

Targeted H5 surveillance (since March 24, 2024)



National surveillance of subset of influenza A positive specimens

National flu surveillance (since February 25, 2024)







Distributed via the CDC Health Alert Network January 16, 2025, 10:00 AM ET CDCHAN-00520

Accelerated Subtyping of Influenza A in Hospitalized Patients

Recommendations include the following:

- Rapid subtyping of all Influenza A positive specimens from *inpatients*, so that non-seasonal strains can be sent to PHL for additional testing
- Inquiring about animal / animal product exposure in patients with ILI
- Enhanced isolation precautions in the inpatient setting



Testing

- Most commercially available influenza panels only differentiate A vs B
- Some commercially available extended RVPs identify seasonal influenza A subtypes (i.e. A(H1) and A(H3)
 - Non-subtypable influenza A on these platforms *may* indicate H5 or other novel subtype
- H5 specific testing available at PHL* and multiple commercial laboratories
 - Specimen requirements vary by lab
- Implementation of HAN variable, barriers remain



Prevention: General public

1. Don't drink raw milk



2. Avoid exposure to sick/dead animals

CDC Issues Updated Guidance to Help Prevent Spread of Flu at Agricultural Fairs

WHAT TO KNOW

- In March 2024, highly pathogenic avian influenza A(H5N1) virus, also known as "H5N1 bird flu," was reported in cows in the United States.
- CDC has issued updated guidance to help prevent the spread of flu between animals and between animals and people at fairs.
- Taking preventive actions at fairs can help protect exhibitors, visitors, and livestock from flu.



Prevention: Agriculture

Farm animal monitoring

Farm worker protection

Protect Yourself From H5N1 When Working With Farm Animals

H5N1 is a bird flu virus that could make you sick. Wear recommended personal protective equipment (PPE) when working directly or closely with sick or dead animals, animal feces, litter, raw milk, and other materials that might have the virus.



Wash hands with soap and water, then put on PPE in this order:

- 1. Fluid-resistant coveralls
- 2. Waterproof apron, if needed for job task
- 3. NIOSH Approved* Respirator (e.g., N95* filtering facepiece respirator or elastomeric half mask respirator)
- 4. Properly-fitted unvented or indirectly vented safety goggles or face shield
- 5. Head cover or hair cover
- 6. Gloves
- 7. Boots



While wearing PPE

- · Use separate designated clean areas, one for putting on PPE and one for taking off PPE.
- · Avoid touching your eyes, mouth, and nose after touching any contaminated material.
- + Do not eat, drink, smoke, vape, chew gum, dip tobacco, or use the bathroom.

Follow these steps to safely remove PPE

- 1. Remove the apron. If worn
- 2. Clean and disinfect boots
- 3. Remove boots
- 4. Remove coveralis
- 5. Remove gloves
- 6. Wash hands with scap and water or alcohol-based hindrub
- 7. Remove goggles or faceshield and then remove respirator
- IL Remove head cover or hair cover
- 9. Wash hands again with soap and water or
- alcohol-based hand rub

April 2024



- · Shower at the end of the work shift.
- Leave all contaminated clothing and equipment at work.
- + Watch for symptoms of illness while you are working with potentially sick animals or materials. Continue watching for symptoms for 10 days after finishing working. If you get sick, tell your supervisor and talk with a doctor.

Reusable and disposable PPE

- While removing PPE, dispose of all disposable PPE appropriately and set aside neusable PPE
- Clean and disinfect reusable PPE after every use



Prevention: <u>Healthcare Setting</u>

- Mask symptomatic patients
- AIIR (private room with door closed if not available)
- PPE: N95 + eye protection + contact



Treatment

- Start empiric oseltamavir if clinical suspicion
 - Consider combination therapy in immunocompromised host and/or severely ill
 - Consider extending to 10d course in severely ill





Test tubes are seen labelled "Brit Flu" words in this illustration taken, June 10, 2024. REUTERS/Dado Ruvic/Illustration/File Phone Purchase Lidensing.Biotes [1]

Takeaways

- 1. Risk of human-to-human transmission remains low
- 2. Impact on agriculture significant
- 3. Basic IP principals are the same
 - Identify patients with ILI + high-risk animal exposure OR with nonsubtypable influenza A
 - Isolate and mask patients with ILI
 - Inform infection prevention, PH authorities